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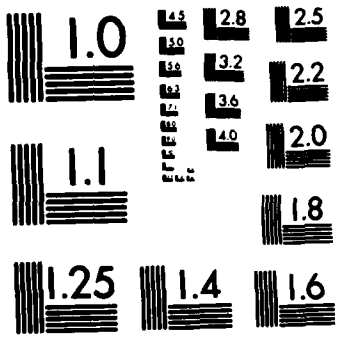

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The Automated Cartography Branch of the U.S. Army Engineer Topographic Laboratories is actively involved in the mapping applications of video disc technology as well as in the use of video disc systems as tactical/operational planning tools for today's Army. The paper discusses the video disc system, developments to date, potentials and problems of the video disc and planned future research

Keywords included

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VIDEO DISCS - WHAT ARE THEY AND WHERE DO THEY FIT IN?

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Introduction

New methods for handling and presenting mapping information are always being sought. With this in mind, the Automated Cartography Branch of the US Army Engineer Topographic Laboratories has focused on the optical video disc as one of its projects for research and development. Particular interest has been directed at the video disc capabilities as a paper map substitute for the storage and retrieval of geographic information and how these capabilities can be exploited.

This paper will discuss the video disc system, its problems and potentials, and research and development to date by the Automated Cartography Branch of the US Army Engineer Topographic Laboratories.

System Description

The system under discussion is composed of the following components: an optical video disc, a laser disc player, a decoder, a touch-panel monitor, a microcomputer and software programs.

The optical video disc has the appearance of a phonograph record except its silver color. It is 12 inches in diameter and approximately 1/8" thick. The disc is capable of holding up to 54,000 frames per side. The disc is non-magnetic and its hard surface makes it resistant to most normal work situation mishaps. The laser disc player may be controlled by a handheld infrared remote control but most often, it is controlled through the microcomputer. The microcomputer is a Systems Group S-100 with a CPM 2.2 operating system. The software is written in Pilot Plus language. It controls the viewing of the video disc, produces graphic overlays for the video scenes, and text. It also allows the user to interact with the system either through the touch-panel monitor or by keyboard. The decoder takes the National Television Standard Committee (NTSC) signal from the video disc player and

changes it to a Red/Green/Blue (RGB) signal for the microcomputer. For user-friendliness, the system has a touch-panel monitor with a resolution of 512 x 480. The touch-panel is comprised of horizontal and vertical infrared beams. When the beams are broken, the coordinates of the interruption are checked with the software program for that particular phase and the scene on the monitor will change accordingly.

Developments To Date

The Automated Cartography Branch of the US Army Engineer Topographic Laboratories has produced one optical video disc of the Columbia River area and another optical disc is currently in production.

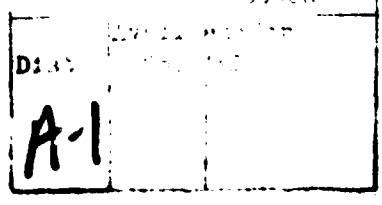
The Columbia River disc contains approximately 45,000 frames of aerial movies, topographic maps, aerial photos, Landsat imagery, and three-dimensional terrain scenes. The Columbia River disc is used for demonstrations and as background scenes for developing the software for the new video disc.

The disc currently in production will contain topographic maps, aerial photos and Landsat imagery, three-dimensional terrain scenes, location photos, vehicle photos and diagrams, and organizational charts and diagrams.

The software being developed for the new video disc is aimed at allowing a user to have fingertip access to large quantities of information without its normal attendant bulk. The software programs will be loaded into the microcomputer from a 5-1/2" floppy disk. Graphic overlays to be used with scenes from the video disc and textual data will also be contained on the floppy disk.

The user will be able to change viewing scenes, from topographic maps to aerial photos, or vice versa. Each scene is registered to the other regarding scale and field of view. The user will also be able to zoom in or out of a geographic location or pan around that particular area.

Other selections on the menu will allow the user to access climate data and other data or photographs necessary for decision-making. The user will also be able to template information on the screen and produce a hardcopy overlay or paper print. Templating allows the user to place symbols on the screen over a map background by selecting the symbol desired and then touching the desired location on the screen. If an error in placement is made, erasing the symbol is accomplished by the same method of touching the desired action square and then the location of the symbol.



Problems

The Columbia River disc has allowed the identification of some problems inherent in video disc systems, in general. The most common of these problems will be addressed now.

It is possible to place 54,000 frames on one side of a video disc; however, there appears to be a common misconception that one frame is the same as one complete map. Unfortunately, the viewing area of a monitor is drastically smaller than what is visible when a map is spread out or hung on a wall since peripheral vision is being used in the latter viewing situation. The largest viewing area for maps scaled 1:50,000 would be 8"x6" and then only for an overall view. For legible lettering, the ideal viewing area size appears to be 3"x2.5" for 1:50,000 maps. These viewing area sizes must, however, be tailored to the different type and scales of maps used. Therefore, transferring maps to a video disc requires splitting the map into separate frames which results in problems discussed below.

The need to split a map into a number of viewing frames has raised the problem of continuity. This can be overcome to a certain extent by overlapping frames. If the overlap is less than 50% between the area covered by adjacent frames, then the viewer can become lost. This loss in continuity can best be overcome by using a generous overlap percentage; at ETL, we try to use 75% overlap.

Another problem which results from splitting a map between a number of frames is referencing. Most maps have longitude and latitude markings at only the outer edge of the map. When viewing the interior of a map contained on a number of frames, the longitude and latitude grid may be visible but the question is "What longitude? What latitude?". A solution would be to have a larger field-of-view per frame, thereby decreasing the number of frames required per map. In the case of a 7-1/2 minute quadrangle map, four frame coverage of the entire map would result in each frame containing longitude and latitude grid notations. However, the result is difficult to read because of the monitor resolution and the large amount of information contained on most maps. This problem has given rise to the speculation that specialized maps need to be produced to be used especially for video disc filming. Such specialized maps would most likely have to have simplified symbolization and a reference grid which would still have meaning when splitting a map between a number of disc frames.

The user may require the ability to zoom in on geographic locations. In this case, one map scale will not be sufficient. To allow for zooming in, a map will be filmed a

number of times. Each filming will involve a change in field-of-view and camera focal point. Each filming will result in a different map scale. When deciding upon different scale levels, care needs to be taken when defining the centerpoints of the frames in each level. If centerpoints are not planned for the different levels, then the centerpoint of the first frame viewed during a zooming in or out sequence may end up "jumping" all over and out of the viewed scene. Instead, the centerpoint should remain stable and the sequence should have the appearance of a camera being rolled closer or farther from the map.

A great deal of planning needs to be done before writing specifications for the production of a video disc. This is necessary because once the video disc is produced, it cannot be changed. If a vital sequence of shots was forgotten, a new video disc will have to be produced. By careful planning, it is possible to have a video disc which can be used for a number of different projects due to the variety of information contained on the disc.

The planning, specification preparation and video disc production phases combined can require upward of six months for completion. This means that a lead time of possibly one year is required from stating the requirement to being able to use the new video disc.

Lastly, video discs are relatively expensive to produce, usually ranging in the neighborhood of $50,000.00 for each new disc for the production and pre-mastering phases. This, in addition to the time required to produce a video disc, make comprehensive planning a must to produce a high quality, fully functionable video disc.

Potentials

Though there are problems associated with video discs, the video disc capabilities make them attractive for a number of uses. The work being done by the Automated Cartography Branch at the US Army Engineer Topographic Laboratories with video discs is presently focused on its use as a planning tool for the field commanders. Quick access to a multiplicity of information required for decision-making makes the video disc system attractive as an operational planning tool for today's Army.

The video disc can be a valuable briefing/familiarization tool. Since aerial movies can be placed on the video discs, recently transferred personnel can be familiarized with their new location in-house rather than out in the field. This might prove especially helpful for pilots before their first flight in the area or for briefings before an aerial

operation. As a briefing tool, the video disc can save the time and expense of creating or replacing worn-out viewgraphs or charts. Instead of tracking down the information required for a briefing to inform groups about an agency's functions and organization, all this information can be placed on a video disc. Since one such briefing is unlikely to occupy the entire disc, a number of informative briefings can be contained on one disc.

A lot of time and money is spent on training personnel to enhance or add to their present skills. Video discs, used as training tools, could cut this cost in time and money appreciably, since training could be accomplished in-house. There have already been some video discs produced which are aimed at this particular use. They include training in map reading, writing technical papers, clearing a mine field, reconnaissance and navigation. Producers of these discs include US Army Europe Continuing Education and Fort Benning.

Because of the discs' large storage capability, warehousing of large quantities of paper materials can become a thing of the past. One video disc is capable of storing the same material contained in three map file cabinets; this means that what used to require an area four feet by three feet by nine feet can be stored on a twelve inch diameter record that is less than one-quarter of an inch thick. Access to the information stored on the disc is much faster than searching through the file drawers looking for a particular item. On academic level, using the video disc for storing images of old and delicate papers, manuscripts and books would allow more than a select group access to this information while preserving the originals. The Library of Congress is using a optical digital disc system for such storage.

Planned Future Research

Other research being undertaken by the Automated Cartography Branch at the US Army Engineer Topographic Laboratories involve the hybrid optical disc, the DRAW (or Direct-Read-After-Write) optical disc, the digital optical disc, and design of graphics for geographic information placed on discs. All of these have a greater degree of flexibility than the video disc.

The hybrid optical disc contains a combination of analog images and digital information. The information can be either digital or analog. The digital information can be fed into one or more programs in the microcomputer and result in views different from those placed on the disc during production.

The DRAW optical disc allows the user to place his/her own information on the disc without waiting four months to get

the disc from a contractor. The flexibility with this disc includes not having to plan the entire discs' contents before the first entry is made on the disc. DRAW optical discs can be either analog or digital.

The optical digital disc contains only digital data, placed on the disc in binary code. The nature of the disc will allow the software programs to be placed directly on the disc, thereby eliminating most of the need for floppy discs which can be erased. The programs can be loaded in to the microcomputer from the disc and use the digital data stored elsewhere on the disc.

One can only expect that the next advance in the disc technology will be an "eraseable" disc which will allow the user to place data onto a disc and then update that data or completely erase the disc and reuse it. This, in fact, is already under development.

SUMMARY

While there are some problems associated with video disc systems, these pale when compared to the system's potentials and capabilities. The video disc system is a valuable tool for a variety of uses. Undoubtedly, more applications for video disc systems will arise as they become more widespread. Given time, the video disc may totally replace paper maps, including those used when driving a car. In fact, the Buick "3 Million Dollar Car of the Future" features a video monitor though its maps are on tape. So, in the not so distant future, a visit to AAA will probably result in not receiving a package of paper maps but rather a compact optical video disc.

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2. NAME OF PROPOSER	3. PERMISSION TO USE NAME IN PROCESSING PROPOSAL ☐ YES ☐ NO	4. DTIC OFFICE SYMBOL
5. SUBJECT OF PROPOSAL	6. My acceptance of a cash award for this proposal constitutes an agreement for the U. S. Government to use the proposal and shall not form the basis for a further claim of any nature upon the U. S. Government by me, my heirs, or assigns. (Signature) (Date)	
7. CURRENT PROCEDURE *(Continue on separate sheet, if necessary)*		
8. HAS A WAIVER BEEN REQUESTED? ☐ YES ☐ NO	IF YES, CITE APPLICABLE REGULATION AND PARAGRAPH.	
9. PROPOSAL *(Continue on separate sheet, if necessary)*		
10. RATIONALE/JUSTIFICATION *(Continue on separate sheet, if necessary)*		
11. BENEFITS *(Optional)*		12. ESTIMATED DOLLAR SAVINGS *(Optional)*

13. 13.	RECOMMENDED ACTION/RATIONALE	SIGNATURE
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14. DTIC-M PROGRAM CONTACT OFFICER *(PCO)* FORWARDED TO _____ (Date) _____		
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